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A BIOLOGICAL EVALUATION OF PONDEROSA PINE NEEDLECAST AND DERMEA CANKER OF DOUGLAS-FIR, SALMON RIVER RANGER DISTRICT, KLAMATH NATIONAL FOREST

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ABSTRACT

We visited plantations on the Salmon River District where Lophodermium needle cast of ponderosa pine and Dermea canker of Douglas-fir had been reported in 1982. The sole option for Lophodermium needle cast is no action except for continued monitoring of growth loss and mortality; for Dermea canker, management alternatives include no action, brush control, pruning, and planting with resistant species.

On April 10 we visited a ponderosa pine plantation at Shadow Creek in which most trees were affected by a needle cast disease; we also visited Douglas-fir plantations near Stage and Rays Gulches where Dermea canker had killed many of the trees. Both disease conditions had been reported in 1982 by Don Osterhoudt, District Silviculturist, but this was our first opportunity to visit the sites. In this report we document the causes of the defoliation and mortality in the plantations, and suggest management alternatives for dealing with the problems.

OBSERVATIONS

Almost all of the ponderosa pines in a 24-year-old, 30-acre plantation at Shadow Creek were affected by Lophodermium needle cast. While most trees were not severely infected, about 10 percent of them retained only one year's healthy needles. The plantation was adequately stocked, most trees had grown above the brush, and there appeared to have been little or no loss of height growth. However, the overall appearance of the plantation was poor, with the still-attached dead needles giving the trees a brownish cast.

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In the approximately 20-year-old Douglas-fir plantations at Stage and Rays Gulches, Dermea canker was affecting most of the 8-15 foot trees on some 60 acres. The District found that about 500 trees died in the last five years, and that limb cankers and branch flagging were prevalent throughout the plantations. Some spots were already understocked, and it appeared likely that mortality would continue.

PEST BIOLOGY

LOPHODERMIUM NEEDLE CAST

Lophodermium needle cast is caused by a fungus, Lophodermium pinastri, that attacks many species of pine. It usually affects third-year or older needles, and is seldom serious. Infected needles often remain attached for several years after they die and turn gray, causing a symptom called gray beard.

Needles become infected in late summer and fall. The following spring, brown spots, often with yellow margins, develop on the infected needles. The needles yellow and turn brown in late spring or early summer, and fruiting bodies develop while the dead needles are still attached to the tree or after they have fallen to the ground. Mature fruiting bodies are shaped like tiny, black footballs, with a longitudinal split down the center. During moist weather, the fruiting bodies open and forcibly discharge their spores, which are carried by wind to nearby healthy needles where they germinate and infect.

Occasionally the disease is serious enough that only current-year's needles remain unaffected. Most trees survive because they develop new needles the following spring. These new needles become infected in late summer and fall, and the disease cycle is repeated. Few trees are killed by defoliation, but repeated needle loss may eventually reduce a tree's growth rate.

DERMEA CANKER OF DOUGLAS-FIR

Dermea pseudotsugae, the causal agent of Dermea canker, infects Douglas-fir in plantations and natural stands in British Columbia and in northwestern California. The fungus is generally considered a weak parasite that attacks host tissue that has been weakened by wounding or by climatic stress, causing branch flagging and occasional top kill. Although it is generally not a problem in natural stands, it can cause considerable mortality in plantations, where it has at times killed 10-50 percent of the trees in ten years. Disease outbreaks in plantations are often associated with planting Douglas-fir where it is poorly adapted, an off-site seed source, or excessive brush competition.

Dieback of limbs and tops is the first obvious symptom of the disease. Trunk cankers originate from infected limbs, and often girdle the tree, causing top kill and sometimes tree death. Fresh cankers have a characteristic reddish margin that disappears when the tree dies. Fruiting bodies are not found on freshly-killed tissue, but develop on dead bark

about a year later. They appear as tiny, black discs about 1.0-1.5 mm in diameter. The Douglas-fir engraver is often associated with the cankers.

DOUGLAS-FIR ENGRAVER

The Douglas-fir engraver, Scolytus unispinosus, attacks weakened, injured, dying, and recently dead young Douglas-fir. It also attacks slash and the tops and limbs of trees killed by the Douglas-fir beetle, Dendroctonus pseudotsugae. During drought, engravers sometimes breed on slash and then kill nearby young Douglas-fir; such outbreaks are sporadic and of short duration. The egg gallery is longitudinal; the larvae work at right angles to the gallery and then turn either up or down. In California there are two generations per year.

MANAGEMENT ALTERNATIVES

LOPHODERMIUM NEEDLE CAST

Without treatment, the prevalence of needle cast will vary with climatic conditions, the wetter years favoring the disease. Trees with two years or more needle retention will probably be little affected, while trees with only one year's needles may suffer some growth loss, particularly if they are undergoing excessive brush competition. The appearance of the plantation will be poor as long as the needle cast is present. The incidence of disease suggests that the site is less than optimum for ponderosa pine. Since the disease has not yet caused serious damage, and since no chemicals are available for controlling the fungus, the only option is no action except for continued monitoring of growth loss and mortality. Experience gained here may prove useful in assessing similar conditions elsewhere. The more severely affected trees can be discriminated against during the first pre-commercial thinning.

DERMEA CANKER OF DOUGLAS-FIR

No Action. Trees already infected will continue to die over the next several years, and uninfected trees may succumb, particularly if climatic conditions or other stresses favor the disease. The plantation may become severely understocked in the next decade. Some trees will send up a new leader and may survive Douglas-fir engraver attacks if conditions for growth improve.

Control Brush to Promote Tree Growth. Where brush competition is severe, brush control will reduce the stress on the trees, cause them to be less susceptible to the disease, and may allow some already-infected trees to send up a new leader and survive engraver attacks. However, individual Douglas-fir that are poorly adapted to the site are unlikely to benefit from this treatment and may succumb to Dermea canker.

Prune Infected Trees. Wherever brush competition is reduced and conditions for growth appear suitable, prune infected trees to ensure their survival. Prune infected limbs at the bole to prevent the fungus from entering and girdling the stem; prune infected tops well below the lower margin of infection so that the tree will send up a new leader. This treatment will save infected trees, but it is labor-intensive and will not prevent reinfection by the fungus in plantations where brush competition is severe or where Douglas-fir is not suited to the site.

Destroy Plantation and Plant with Resistant Species. In understocked sites or wherever survival of Douglas-fir appears problematic, remove the existing trees and plant pines, or otherwise a mixture of pine and fir. Before planting ponderosa pines, be sure they are adapted to the site to avoid problems with Lophodermium needle cast. If mixtures of pine and Douglas-fir are planted, some fir may be lost to Dermea canker, but the plantation should remain adequately stocked.

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